

# Notice of Allowability

Application No.

10/766,596

Examiner

Thanhha Pham

Applicant(s)

PERNG ET AL

Art Unit

2813

## -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 6/29/2005 and interview dated 08/31/2005.
2. ☒ The allowed claim(s) is/are 2-7, 9, 12-14 and 39-42.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All b) ☐ Some\* c) ☐ None of the:
    1. ☒ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.


Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

## Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date 03/19/2004
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date \_\_\_\_\_
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_

  
CARL WHITEHEAD, JR.  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Claim 39 is generic and allowable. Accordingly, the restriction requirement as to the encompassed species is hereby withdrawn and claims 41-42 are no longer withdrawn from consideration since all of the claims to this species depend from or otherwise include each of the limitations of an allowed generic claim.

In view of the above noted withdrawal of the restriction requirement as to the linked species, applicant(s) are advised that if any claim(s) depending from or including all the limitations of the allowable generic linking claim(s) be presented in a continuation or divisional application, such claims may be subject to provisional statutory and/or nonstatutory double patenting rejections over the claims of the instant application. Once a restriction requirement is withdrawn, the provisions of 35 U.S.C. 121 are no longer applicable. See *In re Ziegler*, 44 F.2d 1211, 1215, 170 USPQ 129, 131-32 (CCPA 1971). See also MPEP § 804.01.

## **EXAMINER'S AMENDMENT**

2. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

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Authorization for this examiner's amendment was given in a telephone interview with Murray Smith on 08/31/2005.

The application has been amended as follows:

- In claim 4,
  - lines 2-4, delete "and is comprised of ZrO<sub>2</sub>, HfO<sub>2</sub>, Ta<sub>2</sub>O<sub>5</sub>, TiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, Y<sub>2</sub>O<sub>3</sub> La<sub>2</sub>O<sub>5</sub> or is a silicate, nitride, or oxynitride of one or more of Zr, Hf, Ta, Ti, Al, Y, and La"
- In claim 7,
  - line 2, change "comprises CF<sub>4</sub>," to -- further includes at least one of --
  - lines 2-3, delete "and mixtures thereof"
- In claim 9,
  - line 1, after "claim 12" insert -- wherein said anisotropically etching"
  - line 1, change "comprised of" to -- includes --
  - line 2, change "inert gases including" to -- of --
  - line 2, after "N<sub>2</sub>" insert -- as an inert gas --
- In claim 12,
  - line 9, after "wherein" insert -- said anisotropically etching --
  - line 9, delete "(d)"
  - lines 11-12, delete "a chamber pressure from about 4 to 80 mTorr, a RF power between about 200 and 1000 Watts, a bias power from about 20 to 500 Watts"
  - line 13, after "200°C" delete "for a period of about 5 to 200 seconds"

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line 14, change "further comprised of" to – wherein said anisotropically etching step includes –

line 15, after "sccm" insert – , said oxidant gas including O<sub>2</sub> --

line 16, change "wherein a" to – wherein said –

line 16, change "comprising" to – includes –

line 16, change "is etched by a method that" to -- , wherein said halogen containing gases includes CF<sub>4</sub> and CH<sub>3</sub>F, and wherein said anisotropically etching step --

- In claim 13,

line 9, after "wherein" insert – said anisotropically etching –

line 9, delete "(d)"

lines 11-12, delete "a chamber pressure from about 4 to 80 mTorr, a RF power between about 200 and 1000 Watts, a bias power from about 20 to 500 Watts"

line 13, after "200°C" delete "for a period of about 5 to 200 seconds"

line 14, change "further comprised of" to – wherein said anisotropically etching step includes –

line 14, change "inert gases including" to – of –

line 14, after "N<sub>2</sub>" insert – as an inert gas –

line 15, after "250 sccm" insert -- , said inert gas including Ar –

line 16, change "further comprised of " to – wherein said anisotropically etching step includes –

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line 17, after "300 sccm" insert -- , said oxidant gas including O<sub>2</sub> –

line 18, change "wherein a" to – wherein said –

line 18, change "comprising" to – includes –

line 18, change "is etched by a method that " to -- ,wherein said halogen containing gases includes CF<sub>4</sub>, and wherein said anisotropically etching step --

- In claim 39,

lines 9-10, "a chamber pressure from about 4 to 80 mTorr, a RF power between about 200 and 1000 Watts, a bias power from about 20 to 500 Watts"

line 11, after "200°C" delete "for a period of about 5 to 200 seconds"

line 12, change "further comprised of" to -- wherein said selectively etching includes --

line 13, after "300 sccm" insert -- , said oxidant gas including O<sub>2</sub> --

line 14, change "wherein a" to -- wherein said --

line 14, change "comprising" to -- includes --

line 14, "is etched by a method" to – , wherein said halogen containing gases include CF<sub>4</sub> and CH<sub>3</sub>F, and wherein said selectively etching –

***Allowable Subject Matter***

3. Claims 2-7, 9, 12-14 and 39-42 are allowed.

4. The following is an examiner's statement of reasons for allowance: Recorded Prior Art fails to disclose or suggest the combination of the process steps of removing a high k dielectric layer from a substrate as recited in the base claim 12 including: anisotropically etching through exposed portions of said high k dielectric layer with a

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plasma etch comprising one or more halogen containing gases; wherein said anisotropically etching step is performed in an etch chamber and is comprised of a flow rate between about 2 and 100 standard cubic centimeters per minute (sccm) for the one or more halogen containing gases at a temperature between 20°C and 200°C; wherein said high k dielectric layer includes HfO<sub>2</sub>, wherein said halogen containing gases include CF<sub>4</sub> and CH<sub>3</sub>F, and wherein said anisotropically etching step includes a CF<sub>4</sub> flow rate of about 30 sccm, a CH<sub>3</sub>F flow rate of about 60 sccm, an O<sub>2</sub> flow rate of about 10 sccm, a 5 mTorr chamber pressure, a RF power of about 600 Watts and a bias power of about 200 Watts for a period of about 10 seconds. Recorded Prior Art also fails to disclose or suggest the combination of the process steps of removing a high k dielectric layer from a substrate as recited in the base claim 13 including:

anisotropically etching through exposed portions of said high k dielectric layer with a plasma etch comprising one or more halogen containing gases; wherein said anisotropically etching step is performed in an etch chamber and is comprised of a flow rate between about 2 and 100 standard cubic centimeters per minute (sccm) for the one or more halogen containing gases at a temperature between 20°C and 200°C; wherein said high k dielectric layer includes HfO<sub>2</sub>, wherein said halogen containing gases include CF<sub>4</sub>, and wherein said anisotropically etching step includes a CF<sub>4</sub> flow rate of about 5 sccm, an O<sub>2</sub> flow rate of about 200sccm, an Ar flow rate of about 100 sccm with a chamber pressure of 20 mTorr, a RF power of about 600 Watts and a bias power of about 100 Watts for a period of about 23 seconds to end point plus an overetch period for about an addition 23 seconds beyond end point. Recorded Prior Art fails to disclose

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or suggest the combination of the process steps of method recited in the base claim 39 including: selectively etching exposed portions of said high k dielectric layer with a plasma etch comprising one or more halogen containing gases; wherein said selectively etching step is performed in an etch chamber and is comprised of a flow rate between about 2 and 100 standard cubic centimeters per minute (sccm) for the one or more halogen containing gases at a temperature between 20°C and 200°C; wherein said high k dielectric layer includes HfO<sub>2</sub>, wherein said halogen containing gases include CF<sub>4</sub> and CH<sub>3</sub>F, and wherein said selectively etching includes a CF<sub>4</sub> flow rate of about 30 sccm, a CH<sub>3</sub>F flow rate of about 60 sccm, an O<sub>2</sub> flow rate of about 10 sccm, a 5 mTorr chamber pressure, a RF power of about 600 Watts and a bias power of about 200 Watts for a period of about 10 seconds.

5. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanhha Pham whose telephone number is (571) 272-1696. The examiner can normally be reached on Monday and Thursday 9:00AM - 9:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Thanhha Pham